Demo Instructions and Shopping List

General Supplies for All Demos

1. Paper towels
2. Table cloth(s)
3. Trash bags
4. Access to a trash can/dumpster

Ice Cream in a Bag

Shopping List

1 gallon whole (“vitamin a”) milk or half and half
1 bag sugar
2 oz. vanilla
1 bag salt (preferably ice cream salt/rock salt/kosher salt)
Large zip lock bags (1 gal.)
Small zip lock bags (sandwich)
Ice
Plastic spoons

Directions

1. Thoroughly mix 1/2 cup milk, 1 tablespoon sugar, and 1/2 teaspoon vanilla in sealed zip lock sandwich bag.
2. To the large zip lock bag, add two handfuls of ice and approximately 4 tablespoons of salt.
3. Place small zip lock bag containing milk/sugar/salt into large zip lock bag containing ice/salt.
4. Seal the large zip lock bag and shake well until ice cream is frozen.
5. Enjoy!

Science to discuss

1. **Colligative properties**. Adding salt causes the ice to melt/get colder! This is because heat from the ice is spent to dissolve the salt.
2. Salt can cool the ice from 32 ºF to -6 ºF!

Tie-Dye Milk

Shopping List

Paper plates (20 ct.)
1 gallon whole (“vitamin a”) milk
Set of food coloring dyes
1 bottle dish soap
1 box Q-Tips/cotton swabs
1 small cup or bowl

Directions

1. Squirt some dish soap into the small cup or bowl.
1. Pour milk onto paper plate so that bottom is completely covered.
2. Add 1-4 drops of food coloring onto milk (do not mix).
3. Wet cotton swap with a small amount of dish soap.
4. Lightly touch milk with cotton swap and watch the colors move!

Science to discuss

1. Milk is a solution of water, sugar, and proteins.
2. When soap is added to the milk, it causes the proteins in the milk to roll up into balls (denature) and this **reduces the surface tension** of the milk in that area.
3. The areas of the milk not yet exposed to the soap do not experience this reduction in surface tension.
4. Areas of low surface tension are pulled towards areas of high surface tension, causing the colors to mix outward from the point where the Q-tip touches.

Homemade Lava Lamp

Shopping List

Water bottles (24 ct.)
Vegetable oil (1 gallon)
Set of food coloring dyes (can share with Color Changing Milk demo)
Alka-Selzter (36 ct.)

Directions

1. Pour out water from water bottle until only 1/2 cup of water remains.
2. Add 2-3 drops of food coloring and stir/shake.
3. Fill remainder of bottle with vegetable oil.
4. Add 1/2 of a Alka-Selzer tablet.
5. Enjoy the colorful bubbles, use a flashlight at the bottom to complete the lava lamp effect.

Science to discuss

1. Oil and water don't mix because of differences in **polarity**: oil is non-polar and water is polar
2. Food coloring is polar, so it mixes with the water but not the oil.
3. Water is denser than oil, so it sinks to the bottom of the bottle, until it is disturbed by the Alka-Selzer bubbles.
4. Alka-Selzer contains sodium bicarbonate (baking soda) and citric acid. When the tablet is dissolved in the water, the **basic** sodium bicarbonate reacts with the **acidic** citric acid to produce sodium citrate and carbon dioxide gas. The carbon dioxide gas produces the bubbles that create the lava lamp effect.

Dry Ice in a Balloon

Shopping List

Dry ice (5 pounds) - Purchase at ice supplier, nearby: Jefferson Ice Co.
3617 W Jefferson Blvd, Los Angeles, CA 90016

Balloons (24 ct.)
Funnel
Hammer to crush dry ice

Directions

1. Crush dry ice using the hammer into a fine powder
2. Use funnel to put a small handful of dry ice in a balloon.
3. Tie off the balloon.
4. Wait and watch the balloon fill with carbon dioxide gas.

Science to discuss

1. Dry ice is frozen carbon dioxide.
2. Unlike frozen water (ice), frozen carbon dioxide does not melt, it **sublimes** meaning it transitions directly from a solid to gas with no liquid phase.
3. When dry ice is placed in a sealed balloon, it begins to sublime, filling the balloon with carbon dioxide gas. Be careful! Too much dry ice in the balloon will cause it to explode!
4. Dry ice is much, much colder than regular ice. It's -109 °F compared to 32 °F for regular ice.

Safety Considerations

1. Do not touch the dry ice directly, use gloves or a paper towel! It can cause frostbite because of its extremely cold temperature.
2. Never put dry ice in a sealed rigid container like a water bottle. The resulting explosion has resulted in serious injury and **death** in the past. It's actually **illegal** in California to create "[any] sealed device containing dry ice (CO2) or other chemically reactive substances assembled for the purpose of causing an explosion by a chemical reaction" However, a balloon is OK because it pops before dangerous pressures are reached.
3. Do not overload balloons because if the balloon pops, flying chunks of dry ice can pose a hazard.